CHAPTER 19. AUTOMATED FREQUENCY MANAGEMENT SYSTEM

1900. PURPOSE. The purpose of this chapter is to present policy and an overview on use of the Automated Frequency Management (AFM) system developed for FAA spectrum engineering. For specific instructions on installing and running the AFM system, please consult the separate AFM Users Manuals, available in both printed and machine-readable format. The AFM system should be used by any FAA spectrum engineer who wishes to engineer frequencies, submit or track frequency assignment applications, investigate RFI or analyze the contents of the various AFM data bases, including the GMF, FAA pending frequency assignments, and various international, FCC, and ARINC files.

1901. FREQUENCY MANAGEMENT AND REGISTRATION. ASR is responsible for engineering and recommending approval/disapproval to NTIA for all frequencies, both Government and non-Government, delegated to the AAG (see NTIA Manual, Chapter 1) as well as all FAA frequencies in all frequency bands. FAA registers all of its own frequencies, as well as non-Government frequencies in the AAG bands, with the NTIA. The frequency assignments are then incorporated into the GMF. The AFM system is used to:

(a) Create and modify FAA and NG applications, edit them to insure they conform to FAA and NTIA standards and send them to NTIA for incorporation into the GMF.

(b) Track the progress of applications through the approval process.

(c) Produce management reports on the status of the assignment process.

(d) Produce new FTA forms as applications are approved.

(e) Register frequencies internationally (planned future application).

(f) Review assignments regularly (at least every 5 years) to insure that the frequencies are still in use and the assignments correctly reflect the usage.

(g) Create and modify military and other Government applications in the AAG bands to test for frequency suitability, i.e., to provide coordination with other agencies.

(h) Vote NTIA agendas, i.e., approve or table frequency applications made by other agencies.

1902. FREQUENCY ENGINEERING. Each proposed frequency must be tested to insure that it meets FAA standards for sufficient signal strength within its FPSV and protection from interference. The AFM system provides several models for engineering interference-free frequencies. These models protect both the proposed target and all existing sites, i.e., testing is done on the target as both desired and undesired. These models assist the user in engineering and selecting the best frequency to assign for the most efficient use of the spectrum. The model's results detail reasons for failure/interference, thus assisting the user in exploring ways to engineer a successful frequency, e.g., by using filters, changing the power, etc.

(a) The Air/Ground model is a tool for engineering frequencies in the 118-137 and 225-400 MHz bands. This model performs the following tests, which are further described in Chapter 9 and the appendix.

(1) A co-channel test protects from the same frequency being used in two ATC sectors within interference range of each other.

(2) An adjacent-channel test protects from a frequency ± 25 kHz or ± 50 kHz being used in adjacent ATC sectors.

(3) A co-site test protects from a frequency, usually ± 500 kHz for VHF or ± 1 MHz for UHF, being transmitted near the proposed transmitter.

(b) The NAVAIDS Model performs intersite analysis tests in the bands 108.20-117.95 MHz, 960-1215 MHz, 328.6-335.4 MHz, and 5031-5091 MHz; i.e., LOC, VOR/VOT, DME/TACAN, GS, and MLS frequencies. For GS and MLS testing, co-channel and adjacent-channel testing involves identifying those sites having interferers within designated distances. For DME/TACAN, VOR/VOT, and LOC testing, an ESR is calculated and appropriate curves are extrapolated to determine the required separation distance, as described in Chapter 10 and the appendix of this manual. If ESV's are associated with the target or potential interferer, they are tested also. The target's ESV signal strength is also tested. In order to protect paired NAVAID frequencies, dummy assignments have been created for unassigned associated frequencies.

(c) The NDB Model tests non-directional beacons in the frequency band 190-535 kHz. All potential interferers within a frequency ± 6 kHz from the proposed target are tested. The required separation distance is calculated, based upon the prediction curves and calculation methods described in Chapter 11 of this manual.

(d) Frequency assignment models for fixed, mobile communications, HF communications, radio communications links, and radar are also planned. Until these models are implemented, assignments in those bands are tested by using a generic model, which produces a circle report of potential interferers.

1903. OTHER AFM ENGINEERING FEATURES. Additional features of the AFM assist spectrum engineers in performing engineering analyses. FCC, ARINC and international data bases are maintained and are used by the models and browse/query routines.

(a) Browse and query routines are provided to assist engineers in analyzing the distribution of frequencies throughout the spectrum.

(b) A graphics routine lets users show model and browse/query results on appropriate maps. Users can choose to also map ILS keyholes, glide slope and ESV wedges, DME/VOR circles, and TSV ATC sectors.

(c) An FM report notifies users when FM broadcast stations have changed.

(d) An intermod program helps engineers investigate possible sources of RFI. The

frequencies tested as well as the potential interferer frequencies can be user-entered, selected from a browsed list, and/or selected from a circle report.

(e) A TSV data base is periodically updated. The Centrad model lets users modify a pending TSV data base. These data bases are used by the A/G model as well as the graphics routines.

(f) ESV data can be added to NAVAIDS assignments. The NAVAIDS model is used to test ESV's for signal strength and interference.

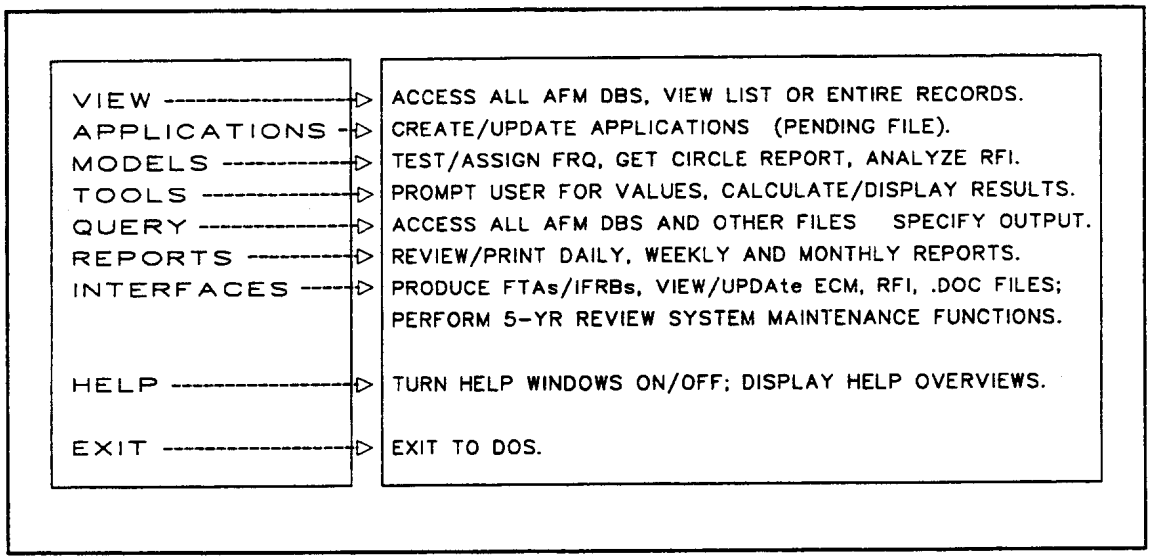
(g) ECM and RFI data bases are planned to be maintained in the future.

(h) Engineering tools are also provided. These include bearing/distance calculations and power/density calculations.

(i) The system documentation includes formulas used in creating the models and tools. This documentation is distributed in printed format as changes are made. It is also available on-line by selecting "Interfaces/Documentation View" in the AFM main menu.

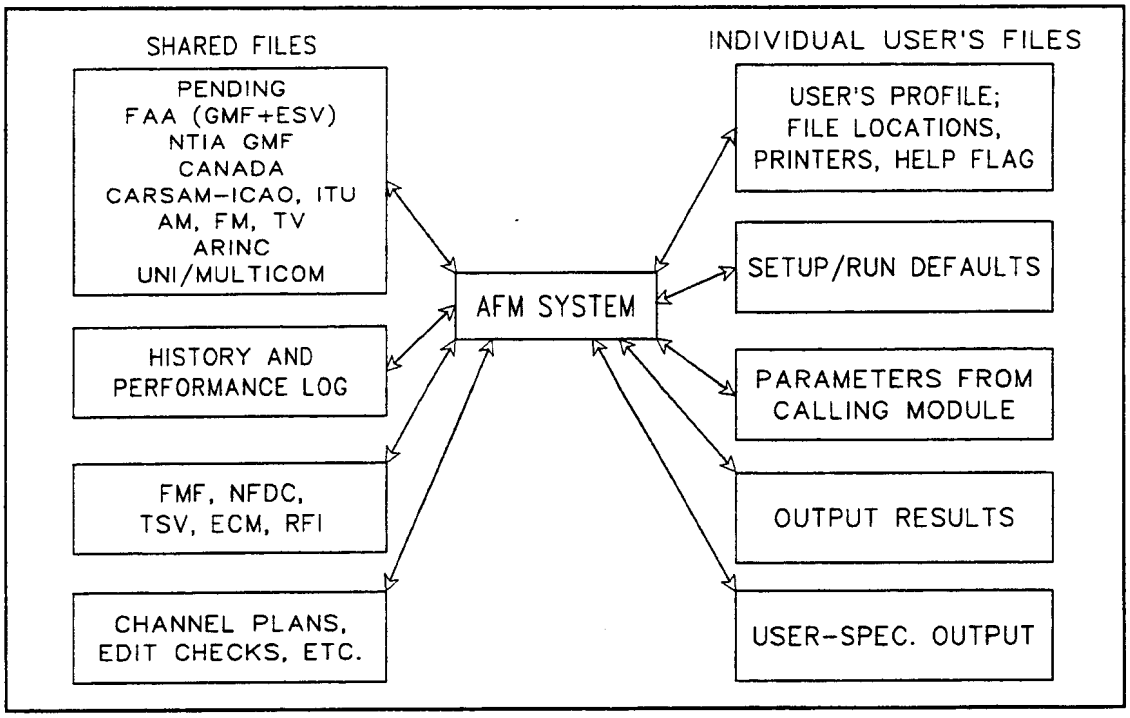
1904. AFM STRUCTURE. Figure 19-1 shows how the features of the AFM system are presented in the main menu. Each option shown in the box has sub-categories to be selected by the user.

Figure 19-1. AFM MAIN MENU SELECTIONS



1905. OPERATION. Figure 19-2 shows the input and output flow of the AFM system. System (shared) files are shown on the left. User (individual) files are shown on the right.

FIGURE 19-2. AFM SYSTEM FLOW CHART (INPUT AND OUTPUT)



1906. TOPOGRAPHY. The AFM is a personal computer based network system. It runs under DOS or in a DOS partition under Windows. The main server is installed at ASR. In addition to the connections provided for users at the FAA headquarters, there are connections for the nine FAA Regional FMO offices, plus Hawaii, the Technical Center and the Aeronautical Center. Users may access the main server via a local LAN, an ADTN X.25 Cloud, or dial-in lines.

(a) Figure 19-3 shows the physical topography for the system, revealing how the requests and data are physically transmitted. The AFM server contains two mirrored hard disks for programs and data, to provide for integrity of the FAA radio frequency data base.

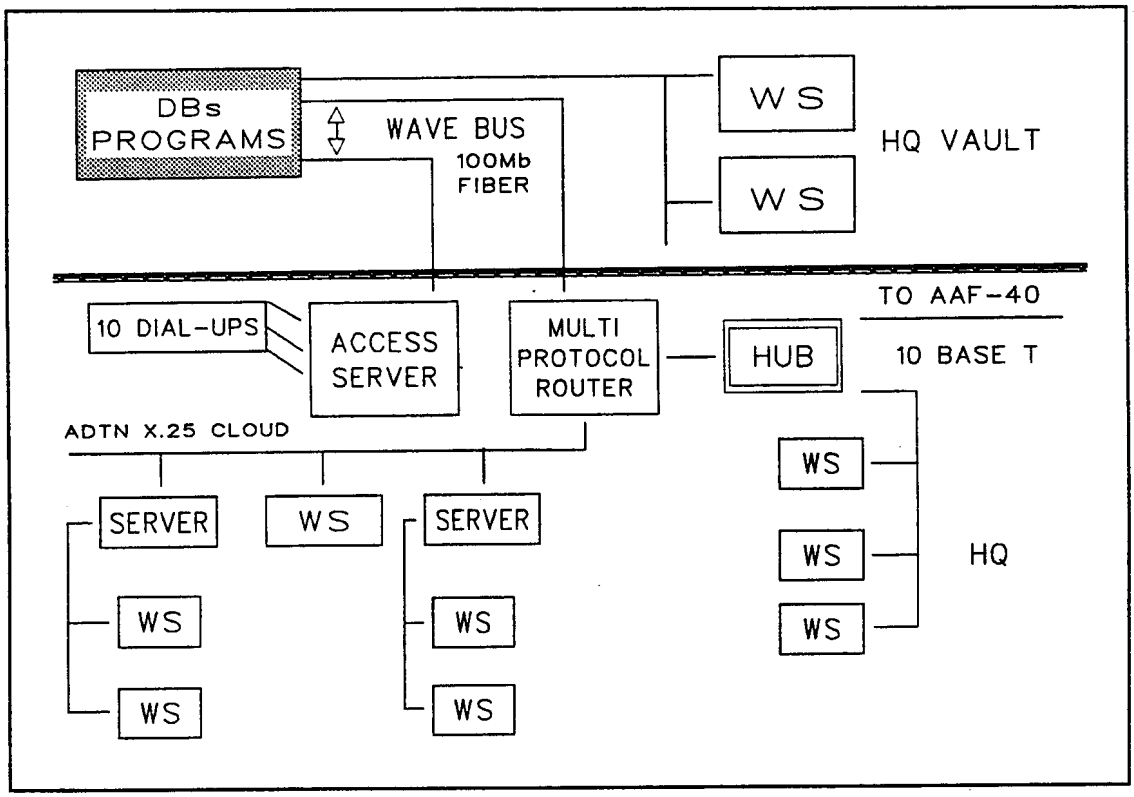
(b) Each user has a user profile which defines where each program and each data base exist. As the user selects a module, the requested program is accessed from the appropriate directory (e.g., a local server). As data are required, requests for the data are formatted and transmitted to the proper device (e.g., a local server or the AFM main server). Data requests are very specific since only necessary fields are requested. Data are compressed before being transmitted and uncompressed after being received. Program execution occurs on the user's computer.

(c) Requests for programs and data may go to a local server or may be sent to the main AFM server at FAA headquarters. The pending file and history log are updated in real time and therefore always will reside only on the AFM headquarters server. Program files and other data files may be copied to local servers as required to obtain acceptable system performance levels.

(d) When users attach to the main AFM server via dial-up, the system is actually run on

the main AFM access server. The access server sends updated screens to the user via the phone line.

FIGURE 19-3. AFM TOPOGRAPHY



1907. SECURITY.

(a) Security involves two issues:

(1) Access to the AFM system.

(2) Access to classified data.

(b) Users access the AFM system through the FAA server. To gain access to the FAA server, the user must enter an identification (ID) and a password. These are checked against a list of valid users. The user ID is passed to the AFM system, and a level of access for that user is determined.

(c) As various AFM modules are activated, a time-out feature is activated. If the user does not press a key for a designated amount of time, the exit functions (including saving of defaults as applicable) are performed, and the user is logged off of the system. This helps prevent unauthorized access to the system through a computer which has been left unsupervised.

(d) Access to various modules is restricted based upon the user ID. For example, the "Vote Directives" module is only accessible by Headquarters engineers; and the "System Maintenance" module functions are only used by network administrators.

(e) Access to the various files is also restricted. For example, only FAA spectrum management personnel are allowed access to the NTIA GMF file. Most non-FAA users will be allowed to access only the FAA (GMF+ESV) file. Ability to change files is restricted, based on user ID. Ability to change pending applications is also restricted.

(f) The other security issue involves access to the NTIA GMF data base, which contains classified records. It has been determined that if all classified records (CLA="C") of the NTIA GMF are removed, the remaining records can be placed on the server to be accessed for frequency engineering purposes. Only qualified users, as determined by the user's access code, are allowed access to the NTIA GMF data base. Whenever users access this data base, they must properly dispose of any printed material or disk files created as part of the frequency engineering process.

(g) The entire NTIA GMF data base is available on a separate Bernoulli disk which can be used on "secure" computers, i.e., computers located in a secure environment. These are not part of the AFM system, but the circle report available to this system is based upon the AFM circle report, and the data used in this system is the same data used to build the AFM NTIA GMF data base.